Project Details

ROSES ID: NRA-01-OSS-01
Selection Year: 2002
Program Element: Independent Investigation: Solar Helio LWS

Project Title:
Observational and Mechanistic Model Studies of the Quasi-Decadal Oscillation

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Summary:
Objectives: Our primary objective is to analyze selected satellite remote sensing data sets for the purpose of determining the stratospheric response to decadal solar ultraviolet variations. A secondary objective is to investigate theoretically mechanisms by which the equatorial quasi-biennial wind oscillation (QBO) may be modulated by decadal solar UV variations. The analytic approach will consist of (1) analysis of intercalibrated satellite ozone profile, column ozone, and temperature data sets extending through the current solar maximum; (3) empirical studies of the extent to which the solar cycle variation of lower stratospheric ozone and temperature may be a consequence of a solar-modulated QBO; and (4) applications of the NRL CHEM2D photochemical transport model, which includes a self-consistently calculated QBO. Significance: The observational component of the proposed work will provide more reliable constraints on general circulation models that are currently being applied to determine the effect of solar variability on long-term climate change. Because of the dominant role of the QBO in determining stratospheric interannual variability, the theoretical component can lead to a better understanding of how decadal solar variability can modulate circulation in the lower stratosphere and upper troposphere. Accomplishments: New Proposal. However, with prior funding under the Solar Influences on Global Change program, we have (a) compared our earlier estimates of the solar cycle variation of stratospheric ozone with those calculated by a representative GCM with parameterized chemistry; (b) reported additional statistical evidence for a solar modulation of the QBO; and (c) begun an investigation of how a solar-modulated QBO may explain a significant part of the solar cycle variation of lower stratospheric ozone. Citations: (1) Hood, L., and B. Soukharev, The solar component of long-term stratospheric variability: Observations, model comparisons, and possible mechanisms, extended abstract for SPARC 2000, Mar del Plata, Argentina, November, 2000. (2) Soukharev, B. and L. Hood, Possible solar modulation of the equatorial quasi-biennial oscillation: Additional statistical evidence, J. Geophys. Res., v. 106, 14855-14868, 2001. (3) Hood, L., The solar cycle variation of total ozone: Dynamical forcing in the lower stratosphere, J. Geophys. Res., v. 102, 1355-1370, 1997.

Publication References:

Summary: "

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